GE Medical Systems

Technical Publications

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Revision C

GE OEC 9800, 2800, 6800, 8800 1K x 1K Workstation X-ray Systems CONFORMANCE STATEMENT for DICOM

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0. INTRODUCTION

0.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections with **Section 0 (Introduction)** describing the overall structure, intent, and references for this Conformance Statement

0.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

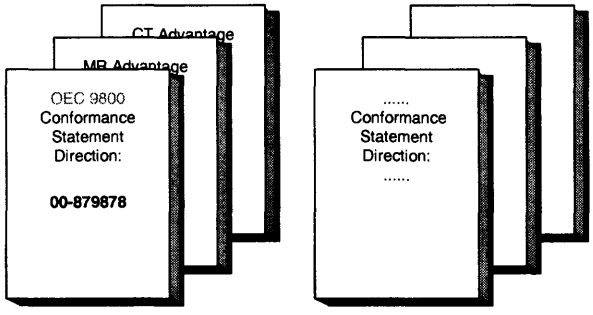
The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM Conformance Statements is shown in the Illustration below.

ID/Net v3.0

Introduction to the Integrated DICOM/Network (ID/Net v3.0) Conformance Statement Direction: 2118780

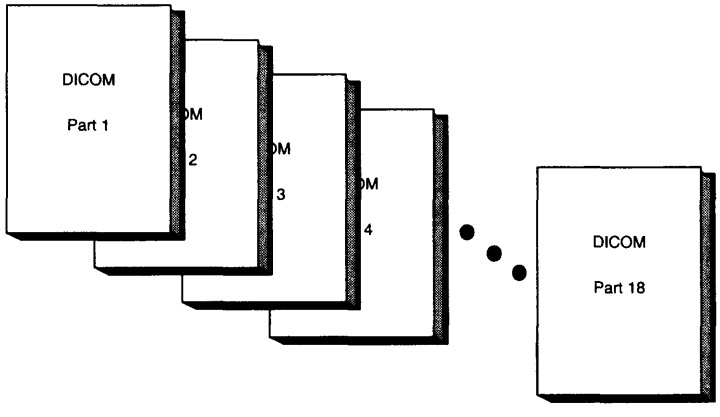
APPLICATION ENTITY SPECIFICATION
(SERVICE CLASSES, INFORMATION OBJECTS, MESSAGE EXCHANGES, ETC.)

Product Implementation:



DICOM STANDARD

Standard Specification:



This document specifies the DICOM implementation. It is entitled:

GE OEC 1K x 1K Workstation X-ray Systems
Conformance Statement for DICOM
00-879878

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements.
The GEMS Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM Part 8 standard.
For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at http://medical.nema.org. Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

0.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standards and with the terminology and concepts which are used in those Standards.
If readers are unfamiliar with DICOM terminology they should first refer to the document listed below, then read the DICOM Standard itself, prior to reading this DICOM Conformance Statement document.

Introduction to the Integrated DICOM/Network (ID/Net v3.0)
Conformance Statement
Direction: 2118780

0.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM. The GEMS Conformance Statements are available to the public.
The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.
Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEMS devices.

0.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation and the stability of the image data for the intended applications.

Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices, which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements.** The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.
- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

0.6 REFERENCES

A list of references, which is applicable to all GEMS Conformance Statements, is included in the *Introduction to the Integrated DICOM/Network (ID/Net v3.0) Conformance Statement, Direction: 2118780.*
The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

0.7 DEFINITIONS

A set of definitions, which is applicable to all GEMS Conformance Statements, is included in *the Introduction to the Integrated DICOM/Network (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

0.8 SYMBOLS AND ABBREVIATIONS

A list of symbols and abbreviations, which is applicable to all GEMS Conformance Statements, is included in the *Introduction to the Integrated DICOM/Network (ID/Net v3.0) Conformance Statement, Direction: 2118780.*

1. IMPLEMENTATION MODEL

Patient demographics may be obtained prior to a procedure using DICOM Query. After producing and storing digital images locally, the GE OEC Systems may be commanded

to store single images or cine data to DICOM compatible storage devices, or may be commanded to print images to DICOM compatible printers. This section presents the Application data flow diagram and provides functional definitions of the Application Entities and their related Real-World Activities.

1.1 Application data flow diagram

Figure 1.1 is the Application data flow diagram for the implementation model. This diagram represents the Application Entities present in this implementation and graphically depicts the relationship of the AE's to real world activities.

When the user has selected a single image or a sequence of images (CINE loop) for storage, the storage AE initiates an association with the storage device. After verifying the device is on-line, the AE will send the image or CINE loop selected to the device. The association is then closed.

When the user selects Query RIS, the Query AE opens an association with a specified server and issues a C-FIND Request. The request contains keys which may be set by the user. The C-FIND responses received are displayed by patient name. The user may then select one of the patients to be entered into the Patient Information screen of the x-ray device.

When the user has selected one or more single images to print, the Printer AE initiates an association with the printing device. After verifying that the device is on-line and ready to print, the AE will send the appropriate number of images to the device for printing until all of the selected images are printed. The association will then be closed.

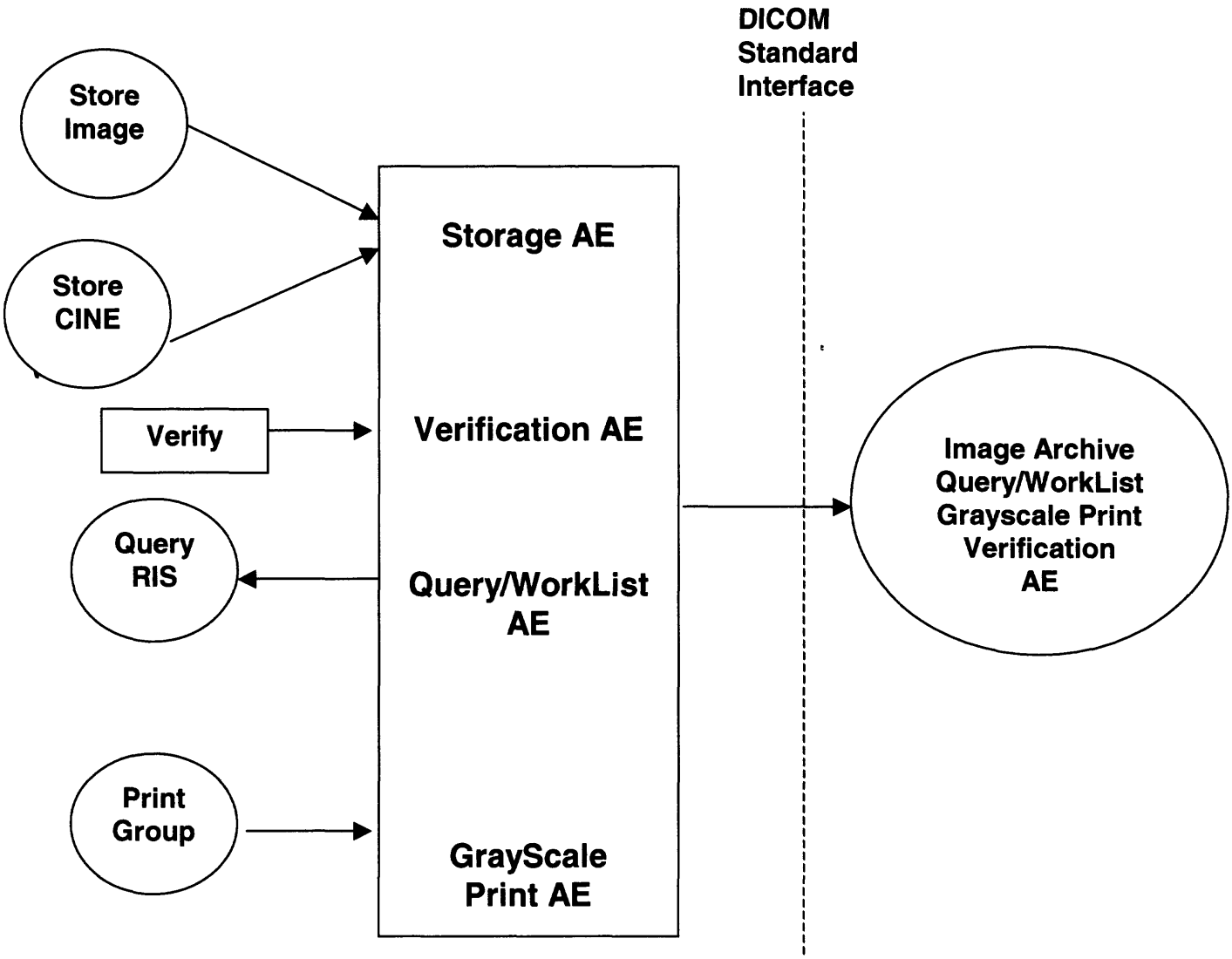


Figure 1.1 Application Data Flow Diagram

1.2 Functional Definition of AE's

1.2.1 Storage Application Entity

The Storage AE acts as an SCU and provides the DICOM Storage Service Class support required to transfer X-ray RadioFluoroscopic, X-ray Angiographic Images and X-ray cine loops to an archive SCP. Secondary Capture is also supported. The AE includes Association Negotiation for the X-ray Storage SOP Class.

1.2.2 Query Application Entity

The Query AE acts as an SCU and provides the DICOM Query/Retrieve Service Class support required to Query the RIS Server or Worklist Broker. The AE issues C-FIND requests using the STUDY level of the Patient Root Query/Retrieve Information Model. If Modality is specified as a search key, the system performs a secondary Series level

query on the matching studies located. The user may also select a Modality Worklist Query. The AE includes Association Negotiation for the Query/Retrieve SOP Classes.

1.2.3 Printer Application Entity

The Printer AE acts as an SCU and provides the DICOM Basic Print Management Class support required to transfer selected sets of X-ray images to a printer SCP for printing. The AE includes Association Negotiation for the Basic Print SOP Class.

1.3 Sequencing of Real World Activities

No sequencing of Real World activities is required. An association is opened at the beginning of each activity and the association is ended when the activity is completed.

2. AE Specifications

2.1 Storage AE Specification

This application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID	Conformance Level
X-ray Angiographic Image Storage Class	1.2.840.10008.5.1.4.1.1.12.1	Standard
X-ray RadioFluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Standard
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Standard

2.1.1 Association Establishment Policies

When the user issues a store command after selecting a single image or CINE Loop from those currently available on the system, the Storage AE will initiate an association. The association will be for X-ray RadioFluoroscopic Image Storage unless the user has specified an alternate modality for single image storage.

2.1.1.1 General

A PDU size of 32000 bytes will be offered and accepted.

2.1.1.2 Number of Associations

Only a single association will be open at any time.

2.1.1.3 Asynchronous Nature

Multiple outstanding transactions are not supported.

2.1.1.4 Implementation Identifying Information

Implementation Version Name: "OEC 9800 v1.0"
Implementation Class UID 1.2.840.113780.1

2.1.2 Association Initiation by Real-World Activity

The Storage AE will initiate an association when it receives a Store Image or a Store CINE command via the user interface.

2.1.2.1 Store Image

2.1.2.1.1 Associated Real-world activity

The associated Real-World Activity is the attempt to transfer an image which is encoded with implicit VR.

2.1.2.1.1.1 Proposed Presentation Contexts

Table 2.1.2.1.2-1 -- Proposed presentation contexts for application entity Storage and real-world activity Store Image

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negotiation**
X-ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-ray RadioFluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Secondary Capture Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.1.2.1.1.2 SOP Specific Conformance to X-ray Angiographic Image Storage SOP Class

The SCU invokes a C-STORE DIMSE Service with a SOP Instance which meets the requirements of the corresponding IOD. The SCU will recognize the status of the C-STORE service and take appropriate action upon the success or failure of the service.

The following tables specify module and element usage for the GE OEC implementation of the X-ray Angiographic Image Storage SOP Additionally, the behavior of the SCU to C-STORE status returns is specified.

Table 2.1.2.1.2.1-1 X-ray Angiographic Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
Equipment	General Equipment	M
Image	General Image	M
	Image Pixel	M
	Cine	C- Reqd if pixel data is Multi-Frame Cine
	Multi-Frame	C- Reqd if pixel data is Multi-Frame Cine
	X-ray Image	M
	X-ray Acquisition	M
	XA Positioner	M
	SOP Common	M

The following Module Attribute tables contain the supported elements for each module in the Module table above.

Table 2.1.2.1.2.1-2 X-ray Angiographic Image Attributes (M)

Name	Tag	Type	VR
Image Type	0008,0008	3	CS
SOP Class UID	0008,0016	see PS3.3 C.12.1.1	UI
SOP Instance UID	0008,0018	see PS3.3 C.12.1.1	UI
Study Date	0008,0020	2	DA
Study Time	0008,0030	2	TM
Accession Number	0008,0050	2	SH
Modality	0008,0060	1	CS
Manufacturer	0008,0070	2	LO
Referring Physician's Name	0008,0090	2	PN
Station Name	0008,1010	3	SH

Study Description	0008,1030	3	LO
Performing Physician's Name	0008,1050	2	PN
Patient's Name	0010,0010	2	PN
Patient ID	0010,0020	2	LO
Patient Birth Date	0010,0030	2	DA
Patient's Sex	0010,0040	2	CS
Agent	0018,0010	2	LO
KV	0018,0060	2	DS
Software Versions	0018,1020	3	LO
Exposure Time	0018,1150	2C	IS
X-ray Tube Current	0018,1151	2C	IS
Radiation Setting	0018,1155	1	CS
Positioner Motion	0018,1500	2C	CS
Positioner Primary Angle	0018,1510	2	DS
Positioner Secondary Angle	0018,1511	2	DS
Study Instance UID	0020,000D	1	UI
Series Instance UID	0020,000E	1	UI
Study ID	0020,0010	2	SH
Series Number	0020,0011	2	IS
Image Number	0020,0013	2	IS
Patient Orientation	0020,0020	2C	CS
Samples per Pixel	0028,0002	1	US
Photometric Interpretation	0028,0004	1	CS
Rows	0028,0010	1	US
Columns	0028,0011	1	US
Bits Allocated	0028,0100	1	US
Bits Stored	0028,0101	1	US
High Bit	0028,0102	1	US
Pixel Represent	0028,0103	1	US
Pixel Intensity Relationship	0028,1040	1	CS
Pixel Data	7FE0,0010	1	OW/OB
Annotation Overlay Pixel Data	6001,3000	1C	OW
Marker Overlay Pixel Data	6002,3000	1C	OW
Number of Rows in Overlay	600x,0010	1	US
Number of Columns in Overlay	600x,0011	1	US
Number of Frames in Overlay	600x,0015	1C	IS
Overlay Type (Graphic)	600x,0040	1	CS
Overlay Origin	600x,0050	1	SS
Image Frame Origin	600x,0051	1C	US
Numbers of Bits Allocated	600x,0100	1	US
Overlay Bit Position	600x,0102	1	US

2.1.2.1.1.3 SOP Specific Conformance to X-ray RadioFluoroscopic Image Storage SOP Class

The SCU invokes a C-STORE DIMSE Service with a SOP Instance which meets the requirements of the corresponding IOD. The SCU will recognize the status of the C-STORE service and take appropriate action upon the success or failure of the service. The following tables specify module and element usage for the GE OEC implementation of the X-ray RadioFluoroscopic Image Storage SOP. Additionally, the behavior of the SCU to C-STORE status returns is specified.

Table 2.1.2.1.2.2-1 X-ray RadioFluoroscopic Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
Equipment	General Equipment	M
Image	General Image	M
	Image Pixel	M
	Cine	C- Reqd if pixel data is Multi-Frame Cine
	Multi-Frame	C- Reqd if pixel data is Multi-Frame Cine
	X-ray Image	M
	X-ray Acquisition	M
	XRF Positioner	M
	SOP Common	M

The following Module Attribute tables contain the supported elements for each module in the Module table above.

Table 2.1.2.1.2.2-2 X-ray RadioFluoroscopic Image Attributes (M)

Name	Tag	Type	VR
Image Type	0008,0008	3	CS
SOP Class UID	0008,0016	see PS3.3 C.12.1 .1	UI
SOP Instance UID	0008,0018	see PS3.3 C.12.1 .1	UI

Study Date	0008,0020	2	DA
Study Time	0008,0030	2	TM
Accession Number	0008,0050	2	SH
Modality	0008,0060	1	CS
Manufacturer	0008,0070	2	LO
Referring Physician's Name	0008,0090	2	PN
Station Name	0008,1010	3	SH
Study Description	0008,1030	3	LO
Performing Physician's Name	0008,1050	2	PN
Patient's Name	0010,0010	2	PN
Patient ID	0010,0020	2	LO
Patient Birth Date	0010,0030	2	DA
Patient's Sex	0010,0040	2	CS
Agent	0018,0010	2	LO
KVP	0018,0060	2	DS
Software Versions	0018,1020	3	LO
Exposure Time	0018,1150	2C	IS
X-ray Tube Current	0018,1151	2C	IS
Radiation Setting	0018,1155	1	CS
Study Instance UID	0020,000D	1	UI
Series Instance UID	0020,000E	1	UI
Study ID	0020,0010	2	SH
Series Number	0020,0011	2	IS
Image Number	0020,0013	2	IS
Patient Orientation	0020,0020	2C	CS
Samples per Pixel	0028,0002	1	US
Photometric Interpretation	0028,0004	1	CS
Rows	0028,0010	1	US
Columns	0028,0011	1	US
Bits Allocated	0028,0100	1	US
Bits Stored	0028,0101	1	US
High Bit	0028,0102	1	US
Pixel Represent	0028,0103	1	US
Pixel Intensity Relationship	0028,1040	1	CS
Pixel Data	7FE0,0010	1	OW/OB
Annotation Overlay Pixel Data	6001,3000	1C	OW
Marker Overlay Pixel Data	6002,3000	1C	OW
Number of Rows in Overlay	600x,0010	1	US
Number of Columns in Overlay	600x,0011	1	US
Number of Frames in Overlay	600x,0015	1C	IS
Indicates Graphic Overlay	600x,0040	1	CS
Overlay Origin	600x,0050	1	SS
Image Frame Origin	600x,0051	1C	US

Numbers of Bits Allocated	600x,0100	1	US
Overlay Bit Position	600x,0102	1	US

2.1.2.1.1.4 SOP Specific Conformance to Secondary Capture Image Storage SOP Class

The SCU invokes a C-STORE DIMSE Service with a SOP Instance which meets the requirements of the corresponding IOD. The SCU will recognize the status of the C-STORE service and take appropriate action upon the success or failure of the service. The following tables specify Module and element usage for the GE OEC implementation of the Secondary Capture Image Storage SOP. Additionally, the behavior of the SCU to C-STORE status returns is specified.

Table 2.1.2.1.2.3-1 Secondary Capture Image IOD Modules

IE	Module	Usage
Patient	Patient	M
Study	General Study	M
Series	General Series	M
Equipment	SC Equipment	M
Image	General Image	M
	Image Pixel	M
	SC Image	M
	SOP Common	M

The following Module Attribute tables contain the supported elements for each module in the Module table above.

Table 2.1.2.1.2.3-2 Secondary Capture Image Attributes (M)

Name	Tag	Type	VR
Image Type	0008,0008	3	CS
SOP Class UID	0008,0016	see PS3.3 C.12. 1.1	UI
SOP Instance UID	0008,0018	see PS3.3 C.12. 1.1	UI
Study Date	0008,0020	2	DA
Study Time	0008,0030	2	TM
Accession Number	0008,0050	2	SH

Modality	0008,0060	1	CS
Conversion Type	0008,0064	1	CS
Referring Physician's Name	0008,0090	2	PN
Station Name	0008,1010	3	SH
Study Description	0008,1030	3	LO
Performing Physician's Name	0008,1050	2	PN
Patient's Name	0010,0010	2	PN
Patient ID	0010,0020	2	LO
Patient Birth Date	0010,0030	2	DA
Patient's Sex	0010,0040	2	CS
Study Instance UID	0020,000D	1	UI
Series Instance UID	0020,000E	1	UI
Study ID	0020,0010	2	SH
Series Number	0020,0011	2	IS
Image Number	0020,0013	2	IS
Patient Orientation	0020,0020	2C	CS
Samples per Pixel	0028,0002	1	US
Photometric Interpretation	0028,0004	1	CS
Rows	0028,0010	1	US
Columns	0028,0011	1	US
Bits Allocated	0028,0100	1	US
Bits Stored	0028,0101	1	US
High Bit	0028,0102	1	US
Pixel Represent	0028,0103	1	US
Pixel Data	7FE0,0010	1	OW/OB

2.1.2.1.1.4.1 SOP Specific Conformance of Storage AE to C-STORE Status returned by SCP

Table 2.1.2.1.2.3-1 Behavior of SCU in response to C-STORE Status

Status	Meaning	Response of Storage AE
A7xx	Refused – Out of Resources	Upon receipt of this status, a message containing the status will be provided to the user. The association will be terminated.
A9xx	Error - Data Set does not match the SOP Class	Same as A7xx
Cxxx	Error – Cannot Understand	Same as A7xx
B000	Warning – Coercion of Data Elements	No Action

B007	Warning – Data Set does not match SOP Class	Same as A7xx
B006	Warning – Elements Discarded	No Action
0000	Success	No Action

2.1.2.2 Store CINE

2.1.2.2.1 Associated Real-world activity

The associated Real-World Activity is the attempt to transfer a CINE run which is encoded with implicit VR.

2.1.2.2.2 Proposed Presentation Contexts

Table 2.1.2.2.2-1 -- Proposed presentation contexts for application entity Storage and real-world activity Store CINE

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
X-ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
X-ray RadioFluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

***2.1.2.2.2.1** SOP Specific Conformance to X-ray Angiographic Multi-Frame Image Storage SOP Class*

The XA IOD described above is also used for storage of CINE runs with the addition of the following attributes. The CINE runs are encoded as XA Multi-Frame images.

Table 2.1.2.2.2.1-1 Additional X-ray Angiographic Image Attributes (M)

Name	Tag	Type	VR
Cine Rate	0018,0040	3	IS
Frame Time	0018,1063	1C	DS
Number of frames	0028,0008	1	IS
Frame Increment Pointer	0028,0009	1	AT

2.1.2.2.2.2 SOP Specific Conformance to X-ray RadioFluoroscopic Multi-Frame Image Storage SOP Class

The RF IOD described above is also used for storage of CINE runs with the addition of the attributes shown in the following table. The CINE runs are encoded as RF Multi-Frame images.

Table 2.1.2.2.2.2-1 Additional X-ray RadioFluoroscopic Image Attributes (M)

Name	Tag	Type	VR
Cine Rate	0018,0040	3	IS
Frame Time	0018,1063	1C	DS
Number of frames	0028,0008	1	IS
Frame Increment Pointer	0028,0009	1	AT

2.2 Query AE Specification

This application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID	Conformance Level
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Standard
Modality Worklist – FIND	1.2.840.10008.5.1.4.31	Standard

2.2.1 Association Establishment Policies

When the user issues a FIND command after setting specific keys from those currently available on the system, the Query AE will initiate an association. The association will be for Study Root Query/Retrieve or Modality Worklist Query dependent upon user selection.

2.2.1.1 General

A PDU size of 32000 bytes will be offered and accepted.

2.2.1.2 Number of Associations

Only a single association will be open at any time.

2.2.1.3 Asynchronous Nature

Multiple outstanding transactions are not supported.

2.2.1.4 Implementation Identifying Information

Implementation Version Name: "OEC 9800 v1.0"
Implementation Class UID 1.2.840.113780.1

2.2.2 Association Initiation by Real-World Activity

The Query AE will initiate an association when it receives Query RIS command via the user interface.

2.2.2.1 Query RIS

2.2.2.1.1 Associated Real-world activity.

The associated Real-World Activity is the attempt to elicit responses from the Query Server through a C-FIND Request. The request is encoded with implicit VR.

2.2.2.1.2 Proposed Presentation Contexts

Table 2.2.2.1.2-1 -- Proposed presentation contexts for application entity Query and real-world activity Query RIS

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negotiation**
Study Root Query SOP Class	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
Modality Worklist SOP Class	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.2.2.1.2.1 SOP Specific Conformance to Study Root Query/Retrieve SOP Class

The SCU invokes a C-FIND-RQ DIMSE Service with a SOP Instance which meets the requirements of the corresponding IOD. The SCU will recognize the status of the C-FIND-RSP service and take appropriate action upon the success or failure of the service. The following tables specify module and element usage for the GE OEC implementation of the Study Root Query/Retrieve SOP. Additionally, the behavior of the SCU to C-FIND_RSP status returns is specified.

The following table contains the keys contained in the STUDY level C-FIND Request.

Table 2.2.2.1.2-1 Keys Utilized for STUDY Level Study Root Query

Description	Tag	Type	VR
Study Date	0008,0020	R	DA
Study Time	0008,0030	R	TM
Accession Number	0008,0050	R	SH
Query/Retrieve Level	0008,0052	R	CS
Referring Physician's Name	0008,0090	O	PN
Patient's Name	0010,0010	R	PN
Patient ID	0010,0020	R	LO
Patient Birth Date	0010,0030	O	DA
Patient's Sex	0010,0040	O	CS
Study Instance UID	0020,000D	U	UI
Study ID	0020,0010	R	SH
Number of Patient Related Studies	0020,1200	O	IS
Number of Patient Related Series	0020,1202	O	IS
Number of Patient Related Images	0020,1204	O	IS

The following table contains the keys contained in the SERIES level C-FIND Request.

Table 2.2.2.1.2-2 Keys Utilized for SERIES Level Study Root Query

Description	Tag	Type	VR
Query/Retrieve Level	0008,0052	R	CS
Modality	0008,0060	R	CS
Study Instance UID	0020,000D	U	UI
Series Instance UID	0020,000E	U	UI
Series Number	0020,0011	R	IS

2.2.2.1.2.1.1 SOP Specific Conformance of Query AE to C-FIND Status returned by SCP

Table 2.2.2.1.2.1-1 Behavior of SCU in response to C-FIND-RSP Status

Status	Meaning	Response of Storage AE
A700	Refused - Out of Resources	Upon receipt of this status, a message containing the status will be provided to the user. The association will be terminated.
A900	Error – Identifier does not match SOP Class	Same as A700
Cxxx	Error – Unable to process	Same as A700

FE00	Matching Terminated due to cancel request	Association will be terminated
0000	Success	No Action
FF00	Pending – matches are continuing	No Action
FF01	Pending – Warning that one or more Optional Keys were not supported - matches are continuing	No Action

2.2.2.1.2.2 SOP Specific Conformance to Modality Worklist SOP Class

The SCU invokes a C-FIND-RQ DIMSE Service with a SOP Instance which meets the requirements of the corresponding IOD. The SCU will recognize the status of the C-FIND-RSP service and take appropriate action upon the success or failure of the service. The following tables specify module and element usage for the GE OEC implementation of the Modality Worklist SOP. Additionally, the behavior of the SCU to C-FIND_RSP status returns is specified. The following table contains the keys contained in the Modality Worklist C-FIND Request.

Table 2.2.2.1.2.2-1 Keys Utilized for Modality Worklist Query

Description	Tag	Type	VR
Scheduled Procedure Start Date	0040,0002	R	DA
Scheduled Procedure Start Time	0040,0003	R	TM
Accession Number	0008,0050	R	SH
Modality	0008,0060	R	CS
Scheduled Performing Physician's Name	0040,0006	O	PN
Patient's Name	0010,0010	R	PN
Patient ID	0010,0020	R	LO
Patient Birth Date	0010,0030	O	DA
Patient's Sex	0010,0040	O	CS

2.2.2.1.2.2.1 SOP Specific Conformance of Query AE to C-FIND Status returned by SCP

Table 2.2.2.1.2.2.1-1 Behavior of SCU in response to C-FIND-RSP Status

Status	Meaning	Response of Storage AE
A700	Refused – Out of Resources	Upon receipt of this status, a message containing the status will be provided to the user. The association will be terminated.
A900	Error – Identifier does not match SOP Class	Same as A700
Cxxx	Error – Unable to process	Same as A700
FE00	Matching Terminated due to cancel request	Association will be terminated
0000	Success	No Action
FF00	Pending – matches are continuing	No Action
FF01	Pending – Warning that one or more Optional Keys were not supported - matches are continuing	No Action

2.3 Printer AE Specification

This application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID	Conformance Level
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Standard
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Standard
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Standard
Basic Grey Image Box SOP Class	1.2.840.10008.5.1.1.4	Standard
Printer SOP Class	1.2.840.10008.5.1.1.16	Standard

2.3.1 Association Establishment Policies

When the user issues a print command after selecting a set of one or more images to be printed, the Printer AE will initiate an association with the SCP for the Basic Grayscale Print Management Meta SOP Class.

2.3.1.1 General

A PDU size of 32000 bytes will be offered and accepted.

2.3.1.2 Number of Associations

Only a single association will be open at any time.

2.3.1.3 Asynchronous Nature

Multiple outstanding transactions are not supported.

2.3.1.4 Implementation Identifying Information

Implementation Version Name: "OEC 9800 v1.0"
Implementation Class UID 1.2.840.1.113780.1

2.3.2 Association Initiation by Real-World Activity

2.3.2.1 Print Group

2.3.2.1.1 Associated Real-world activity

The associated Real-World Activity is the attempt to print a group of images which are encoded with implicit VR. The Printer AE will initiate an association when it receives a Print Group command via the user interface.

2.3.2.1.2 Proposed Presentation Contexts

Table 2.3.2.1.2-1 -- Proposed presentation contexts for application entity Printer and real-world activity Print Group

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			**Extended**
Name	**UID**	**Name List**	**UID List**	**Role**	**Negotiation**
Basic Grey Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.3.2.1.2.1 SOP Specific Conformance to Basic Grey Print Management Meta SOP Class

Print Management conformance is defined in terms of supported Meta SOP Classes, which correspond with the mandatory functionality, and of supported optional SOP Classes, which correspond with additional functionality. The OEC implementation of the Printer AE supports the Basic Grayscale Print Management Meta SOP Class as an SCU only. Table 2.2.2.1.1-2 lists the supported SOP Classes.

Table 2.3.2.1.2.1-1 -- Supported SOP Classes

SOP Class	Reference	Usage as SCU
Basic Film Session SOP Class	H.4.1	M
Basic Film Box SOP Class	H.4.2	M
Basic Grayscale Image Box SOP Class	H.4.3.1	M
Printer SOP Class	H.4.6	M

2.3.2.1.2.1.1 **Basic Film Session SOP Class DIMSE Service Elements and Supported Attributes**

The following tables list the supported DIMSE Services and Supported attributes of the Basic Film Session SOP Class.

Table 2.3.2.1.2.1.1-1 -- Supported Services

DIMSE Service Element	Usage SCU/SCP
N-CREATE	M/M

Note: If a status other than SUCCESS is returned from any of the supported DIMSE services, the association will be closed and the user will be notified as to the nature of the Failure or Warning.

Table 2.3.2.1.2.1.1-2-- N-CREATE Attribute List

Attribute Name	Tag	VR	Usage SCU/SCP
Number of Copies	2000,0010	IS	U/M
Print Priority	2000,0020	CS	U/M
Medium Type	2000,0030	CS	U/M
Film Destination	2000,0040	CS	U/M
Film Session Label	2000,0050	LO	U/U

2.3.2.1.2.1.2 **Basic Film Box SOP Class DIMSE Service Elements and Supported Attributes**

The following tables list the supported DIMSE Services and Supported attributes of the Basic Film Box SOP Class.

Table 2.3.2.1.2.1.2-1 -- Supported Services

DIMSE Service Element	Usage SCU/SCP
N-CREATE	M/M

Note: If a status other than SUCCESS is returned from any of the supported DIMSE services, the association will be closed and the user will be notified as to the nature of the Failure or Warning.

Table 2.3.2.1.2.1-2 -- N-CREATE Attribute List

Attribute Name	Tag	VR	Usage SCU/SCP
Image Display Format	2010,0010	ST	M/M
Referenced Film Box Sequence	2010,0500	SQ	M/M
>Referenced SOP Class UID	0008,1150	UI	M/M
>Referenced SOP Instance UID	0008,1155	UI	M/M
Film Orientation	2010,0040	CS	U/M **"PORTRAIT"**
Film Size ID	2010,0050	CS	U/M
Min Density	2010,0120	US	U/M
Max Density	2010,0130	US	U/M
Configuration Information	2010,0150	ST	U/M
Border Density	2010,0100	CS	U/U
Empty Image Density	2010,0110	CS	U/U

2.3.2.1.2.1.3 **Basic Grayscale Image Box SOP Class DIMSE Service Elements and Supported Attributes**

The following tables list the supported DIMSE Services and Supported attributes of the Basic Grayscale Image Box SOP Class.

Table 2.3.2.1.2.1.3-1 -- Supported Services

DIMSE Service Element	Usage SCU/SCP
N-SET	M/M

Note: If a status other than SUCCESS is returned from any of the supported DIMSE services, the association will be closed and the user will be notified as to the nature of the Failure or Warning.

Table 2.3.2.1.2.1.3-2 -- N-SET Attribute List

Attribute Name	Tag	VR	Usage SCU/SCP
Image Position	2020,0010	US	M/M
Preformatted Grayscale Image Sequence	2020,0110	SQ	M/M
>Samples Per Pixel	0028,0002	US	M/M
>Photometric Interpretation	0028,0004	CS	M/M
>Rows	0028,0010	US	M/M
>Columns	0028,0011	US	M/M

>Pixel Aspect Ratio	0028,0034	IS	M/M
>Bits Allocated	0028,0100	US	M/M
>Bits Stored	0028,0101	US	M/M
>High Bit	0028,0102	US	M/M
>Pixel Representation	0028,0103	US	M/M
>Pixel Data	7FE0,0010	OW/OB	M/M

2.3.2.1.2.1.4 **Printer SOP Class DIMSE Service Elements and Supported Attributes**

The following tables list the supported DIMSE Services and Supported attributes of the Printer SOP Class.

Table 2.3.2.1.2.1.4-1 -- Supported Services

DIMSE Service Element	Usage SCU/SCP
N-ACTION	M/M

Note: If a status other than SUCCESS is returned from any of the supported DIMSE services, the association will be closed and the user will be notified as to the nature of the Failure or Warning.

2.4 Verification AE Specification

This application Entity provides Standard Conformance to the following DICOM SOP Classes as an SCU:

SOP Class Name	SOP Class UID	Conformance Level
Verification SOP Class	1.2.840.10008.1.1	Standard

2.4.1 Association Establishment Policies

When the user issues a Verify command within a specific server configuration screen, the Verification AE will initiate an association.

2.4.1.1 General

A PDU size of 32000 bytes will be offered and accepted.

2.4.1.2 Number of Associations

Only a single association will be open at any time.

2.4.1.3 Asynchronous Nature

Multiple outstanding transactions are not supported.

2.4.1.4 Implementation Identifying Information

Implementation Version Name: "OEC 9800 v1.0"
Implementation Class UID 1.2.840.1.113780.1

2.4.2 Association Initiation by Real-World Activity

When the user issues a Verify command within a specific server configuration screen, the Verification AE will initiate an association.

2.4.2.1.1 Proposed Presentation Contexts

Table 2.4.2.1.2-1 -- Proposed presentation contexts for Verification AE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification SOP Class	1.2.840.10008.1.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

2.4.2.1.2 SOP Specific Conformance to Verification SOP Class

The Verification AE provides standard conformance to the Verification SOP Class as an SCU.

3. COMMUNICATION PROFILES

3.1 Supported Communications stacks

All AEs provide DICOM TCP/IP Network Communications support as defined in Part 8 of the standard.

3.2 TCP/IP Stack

The AEs inherit their TCP/IP Stack from Nucleus NET, a "Sockets like" interface compatible with the RTOS of the Application.

3.2.1 Physical Media Supported

The physical media supported by the TCP/IP Stack are 10BaseT and 100BaseT.

4. Extensions / Specializations / Privatizations

None

5. Configuration

Configuration information is obtained from the system. Users are allowed to set up multiple selectable configurations for Store and Print using Keyboard/Touch Screen entry and selection of valid parameters from pull down menus.

5.1 AE Title/presentation address mapping

The local AE Title is user configurable, with a default of "OEC_9800".

Modality is configurable between XA, RF, and SC. Transmission of the Overlay Data Elements (600x,3000) is configurable. Institution Name and Station Name are also user configurable. Query associations are configurable between Study Root Query or Modality Worklist. These locally configurable items are accessible to the user through the CUSTOMIZE Menu.

5.2 Configurable parameters

SCP IP Address, Port Number, AE Title, and Gateway are configuration parameters for Storage, Query, and Print.

Specifically, Print configuration parameters include the following:

1. Number Of Copies
2. Print Priority
3. Medium Type
4. Film Destination
5. Film Format
6. Film Size ID
7. Config Info
8. Maximum Density
9. Minimum Density
10. Border Density
11. Empty Density

User specified Query keys include the following:

1. Patient Name
2. Patient ID
3. Accession Number
4. Study Date
5. Study Time
6. Referring Physician
7. Modality

6. Support of extended character sets

This implementation does not support extended character sets.